

## Remarks

### **The amendment to claim 19 and the rejection under 35 U.S.C. 101**

The claim as amended is supported at least by FIG. 4 as originally filed and the description of the Figure which begins at page 12, line 26 of the Specification as originally filed. The amended claim's "valuations for the particular allocations of the funds to the asset class [that are] stored in the storage for access by the processor" are shown as allocation result spreadsheet 321 in FIGs. 3 and 4.

Claim 19 as amended satisfies the requirement of MPEP 2106(IV)(C)(2)(2) that the claimed invention produces a "useful, concrete, and tangible result". In his rejection, Examiner found that claim 19 produced no tangible result. As presently amended, the claim clearly does produce a "tangible result": the "valuations for the particular allocations of the funds [are] stored in the storage for further access by the processor". The valuations thus actually exist in the claim's "storage accessible to a processor" and the processor can access them there for display or for further analysis.

### **Amended claim 23**

The amendment simply brings claim 23's use of terminology into conformity with that of claims 19-26.

### **New claims 25 and 26**

Claim 25 is a version of claim 19 in which the limitation "linear optimization program" has been replaced by the limitation "optimization program". New claim 26 is a similar version of claim 20. The new claim term "optimization program" is supported at page 8, lines 13-16 of Applicants' Specification, and as is clear from the discussion at page 23, lines 15-24, "optimization program" includes both linear and non-linear optimization programs. New claims 25 and 26 are thus fully supported by the Specification as filed.

### **Traversal of the rejection under 35 U.S.C. 103**

The rejection under 35 U.S.C. 103 is based on the combination of Huberman with Van Mieghem.

Claim 19 as presently amended reads as follows:

1       **19.** (currently amended) A method of allocating investment funds among a set of  
 2       at least two asset classes to optimize valuation of the asset classes over a period of  
 3       time, data concerning the asset classes being stored in storage accessible to a  
 4       processor and the method comprising the steps performed in the processor of:  
 5               employing a linear optimization program to optimize the valuation and  
 6               in the linear optimization program, using a real option function to  
 7       determine valuation for each asset class over the period of time for a particular  
 8       allocation of the funds to the asset class, the valuations for the particular  
 9       allocations of the funds to the asset class being stored in the storage for access by  
 10       the processor.

As set forth in MPEP 2142, in order to reject a claim under 35 U.S.C. 103, Examiner  
 must make a *prima facie* case of obviousness. A necessary element of the *prima facie*  
 case is a demonstration that the combined references disclose all of the limitations of the  
 15   claim under rejection.

Examiner finds the step of "employing a linear optimization program to optimize the  
 valuation" in Huberman's FIG. 10 and at col. 15, line 60, which reads as follows:

20       Similarly, for the restart strategy comprising sending N initial copies of  
       the message, the expected cost is a linear function of N. Thus, while a  
       different three-dimensional curve would result, the same  
       performance/monetary costs argument applies.

The difficulty here is that a "linear function" is not a "linear optimization program". A  
 25   "linear function" is one that has the form  $y=ax+b$ . As set forth in Huberman, the cost of  
 the messages is indeed a linear function of the number of messages  $N$ . The claimed  
 "linear optimization program" is a species of the "optimization program" disclosed at  
 page 8, lines 13-16. In the prototype embodiment, the "optimization program" is  
 embodied in the Matlab minimization function `fmincon`, described at page 10, lines 8-

30   12 of Applicants' Specification:

      The maximization is done by a Matlab minimization function 305 called  
       `fmincon` (the Matlab function program includes only minimization  
       functions). The minimization function takes as arguments an objective  
       function and a constraint function, both user-defined, together with a  
 35   starting allocation.

There is no disclosure of "optimization programs" anywhere in Huberman. Huberman speaks of optimization in general, but does not describe any specific technique for optimization. The only mention of "linear" in Huberman is at the location cited by  
5 Examiner, and as already pointed out, Applicants' "optimization program" is not Huberman's "linear function".

Examiner admits that Huberman does not disclose anything about real options. For that limitation, Examiner refers Applicants to van Mieghem's *Abstract*. The location in  
10 question sets forth the following:

I develop a theory of investment in multiple real assets or "resources". This theory focuses on the interaction among uncertainty, irreversibility, investment timing, and multidimensionality within the investment portfolio. Using a "real options" approach, this work provides qualitative  
15 insights on the character of optimal investment strategies and special "hedging opportunities that arise in multi-dimensional models of real investments.

On close examination of the use of "real options" in van Mieghem, it becomes clear that  
20 the manner in which van Mieghem uses the term "real options" is fundamentally different from the way the term is used in Applicants' Specification and claims. Real options are explained at page 2, lines 11-21 of Applicants' Specification as follows:

The advantage of the real option model is that it takes better account of uncertainty ... because things are uncertain, the risk and return for an  
25 action to be taken at a future time is constantly changing. This fact in turn gives value to the right to take or refrain from taking the action at a future time. Such rights are termed *options*. Options have long been bought and sold in the financial markets. The reason options have value is that they reduce risk: the closer one comes to the future time, the more is known  
30 about the action's potential risks and returns. Thus, in the real option model, the potential value of a resource allocation is not simply what the allocation itself brings, but additionally, the value of being able to undertake future courses of action based on the present resource allocation.

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A technique for calculating the value of a real option using the Black-Scholes formula is presented at page 7, line 26-page 8, line 12. Page 8, lines 13-16 further show how an optimization program can be used to maximize the real option value of a portfolio.

5 As is abundantly clear from the foregoing, the real options of Applicants' Specification have prices, i.e., they have *quantitative values*. Indeed, it is *because* real options have quantitative values that a function which computes real option values can be used as the objective function in an optimization program.

10 That the "real options" of van Mieghem are different from those of the financial world is initially clear from van Mieghem's use of quotation marks to set off the term and from his statement that his dissertation "provides *qualitative* insights on the character of optimal investment strategies" (emphasis added). If van Mieghem's "real options" were like those of the financial world, he would be able to provide *quantitative* insights as well.

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What van Mieghem means by real options becomes clearer at the bottom of page 1 and the top of page 2 of his dissertation:

20 I develop a theory of multi-resource investment under uncertainty. The focus is on investments in *real* assets. To stress the distinction, but at the same time the analogy, with investment in financial assets, the 'opportunities to acquire real assets are sometimes called *real options*' (cite). This dissertation provides a 'real options' approach to multi-dimensional investment.

25 To begin with, van Mieghem uses the term "real assets" to distinguish the assets he is concerned with from "financial assets". As set forth further on in pages 2 and 3, real assets are investments in plant and equipment and people. van Mieghem's "real options" approach is aimed at analyzing these kinds of investments using a methodology which is *analogous to* the real options methodology used to analyze financial investments. A  
30 fundamental distinction between his "real options" methodology and the real options methodology used in finance is, however, that van Mieghem's results remain *qualitative*, while the results of the financial methodology are *quantitative*. Because van Mieghem's results are *qualitative*, finally, van Mieghem cannot and does not disclose a real option

function that can be plugged into an "optimization program" as required by Applicants' claim 19.

5 The combination of Huberman and van Mieghem thus discloses neither the claimed step of "employing a linear optimization program" nor the claimed step of "in the linear optimization program, using a real option function" and Examiner has not made his *prima facie* case of obviousness. As Examiner will immediately see, the argument made above with regard to claim 19 applies equally to new claim 25.

#### 10 **The dependent claims**

The dependent claims are of course all patentable because they are dependent from patentable claims. However the dependent claims further have additional limitations that are not disclosed in either Huberman or van Mieghem and are consequently patentable in their own rights over the combination of references.

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The limitations of claims 20-24 and claim 26 are all concerned with the use of the reliability of the return for a portfolio as a constraint in the linear optimization program.

In the context of Applicants' Specification, "reliability" is defined as follows:

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Part of intelligent allocation of a resource among a number of uses is making sure that the returns for the uses are subject to different risks. To give an agricultural example, if the resource is land, the desired return is a minimum amount of corn for livestock feed, some parts of the land are bottom land that is subject to flooding in wet years, and other parts of the land are upland that is subject to drought in dry years, the wise farmer will allocate enough of both the bottom land and the upland to corn so that either by itself will yield the minimum amount of corn. In either a wet or dry year, there will be the minimum amount of corn, and in a normal year there will be a surplus.

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Reliability analysis can be applied to resource allocation in a manner that is analogous to its application to physical systems. The bottom land and the upland are redundant systems in the sense that either is capable by itself of yielding the minimum amount in the wet and dry years respectively, and consequently, the reliability of receiving the minimum amount is very high. In mathematical terms, a given year cannot be both wet and dry, and consequently, there is a low correlation between the risk that the bottom land planting will fail and the risk that the upland planting

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will fail. *As can be seen from the example, the less correlation there is between the risks of the various uses for a given return, the more reliable the return is.* (emphasis added)

5 Examiner finds claim 20's "risk over a period of time for each asset class" in Huberman's FIGs. 4, 7-11, but what these FIGs. show is the effect of using two different procedures or two instances of a procedure to compute a solution to a mathematical problem that is NP hard (FIGs. 4, 7, and 8). In FIG. 8, the two procedures use techniques that are independent of each other and performance is increased by having the procedures  
10 communicate with each other. FIG. 9 shows the effects of various restart policies on expected completion time and risk for messages sent via the Web. FIG. 10 shows how restart policies are affected by adding a monetary cost of each message as a factor. FIG. 11 shows the effect of sending two copies of the message, each one having a different priority. The cited location in col. 15, lines 60-62 merely defines the cost as a linear  
15 function of N. The closest any of this comes to the notion of reliability as it is used in Applicants' Specification and claims is FIG 8's notion of using independent procedures that communicate with each other to solve NP hard problems. There is also nothing in Huberman concerning "allocation of funds to asset classes", and consequently, the reference does not disclose Applicants' specific limitation of "employing a constraint in  
20 the linear optimization program that specifies a reliability of a return for the portfolio for a particular allocation of funds to the asset classes in the set".

As for claim 21, the "risk" of claim 20 is per-asset class; consequently, the added limitation of claim 21 has to be interpreted as "a plurality of risks [for the asset classes]".

25 The curves cited by Examiner show risk vs. time curves for combinations of procedures for solving NP hard problems and for combinations of message restart strategies.

With regard to claim 22, as already pointed out, Huberman discloses nothing corresponding to Applicants' notion of reliability or about the allocation of funds. As for  
30 Examiner's notion that "'risk' is a form of the reliability", as set forth in Applicants' Specification, reliability involves not just risk, but also *reducing the correlation among risks*.

Concerning claims 23 and 24, Examiner refers Applicants to col. 19, lines 1-10, which explains how Huberman's techniques can be used to allocate memory or screen space between two types of information goods. Part of the technique is determining the standard deviation for the number of times each type of information goods is accessed in a given period. There is simply no notion here of using the data to determine correlations between the asset classes with regard to the risks of the asset classes and using the correlations to determine the reliability of the return (claim 22), using the correlations to determine a standard deviation of the risk for the particular allocation (claim 23), or to the steps for determining the standard deviation of the risk that are set forth in claim 24.

### Conclusion

Applicants have amended claim 19 to overcome the rejection under 35 U.S.C. 101 and have corrected claim 23. Claims 19 and 23 as amended and new claims 25 and 26 are supported by the Specification as originally filed. Applicants have further demonstrated that the references do not disclose all of the limitations of claims 19-26 and that Examiner's rejection of those claims under 35 US 103 for obviousness is without basis. Applicants have consequently been fully responsive to Examiner's Office action of 4/2/07 as required by 37 C.F.R. 1.111(b) and respectfully request that Examiner continue with the examination and allow the claims as amended. No fees are believed to be required for this amendment; should any be, please charge them to deposit account number 501315.

Respectfully submitted,

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